Radar Type 285

Radar Type 285 was manufactured in UK and was introduced to the R.N. in January 1941. The R.A.N. commenced installation in Australian ships during late 1941. Type 285's primary function was AA Fire Conrol, operating at a frequency of 450 Megacycles (Hertz). Peak power output was 15 Kilowatts with a pulse duration of 1.5 microseconds. The transmitted energy beam in the horizontal was 20° via a system of stacked Yagi arrays.

Radar Type 285 was fitted to the following Royal Australian Navy ships during WW2:

Cruisers

Australia. Canberra. Hobart. Perth. Shropshire.

Destroyers

Arunta. Bataan. Napier. Nepal. Nestor. Nizam. Norman. Quadrant. Quality. Queenborough. Quiberon. Quickmatch. Warramunga.

Frigates

Barcoo. Barwon. Condamine. Culgoa. Diamantina. Gascoyne. Hawkesbury. Lachlan. Macquarie. Murchison. Shoalhaven.

In HMAS Shropshire, one Type 285 controlled the 4 inch Antiaircraft guns providing range and bearing measurements for fire control. The antenna was mounted aft on the High Angle Control Director. The 285 office was located below decks. As well there were 2 Type 285s used for control of the port and starboard pom poms.

Three Type 285s were fitted in HMAS Hobart for the 4 inch gun control. The Yagi antennas and transmitter were tuned to 450 Mcs. The "A" scan displays were mounted in the Directors.

I do not know the location of the 285 office nor aerial in Arunta. The office was possibly in the Director housing, and the aerial would have been mounted fairly high on the superstructure or mast. Examination of a good photograph of this vessel would probably show the aerial array. For ease of recognition look for 5 (note 1) "pig trough" reflectors mounted side by side with 2 Yagi arrays side by side associated with each reflector.

The Problem

No warship fitted with radar during WW2 was immune from the problem of water ingress to the various above deck cables. Water, especially when it becomes contaminated, is an electrical conductor. Effective radar operation depends upon total electrical insulation at a number of points in the system. Because of the design criteria and manufacture methods, the above deck components of Type 285 susceptible to this problem were the antenna, the antenna cabling and in particular the cable junction boxes.

The antenna array was a system of 5 (note 1) Yagi aerial arrays, each comprising a ‘pig trough’ shaped reflector behind 2 Yagi assemblies. These assemblies had one active transmitting/receiving dipole and 6 directing dipoles. Electrical connection from the transmitter/receiver to the aerial array was via a system of coaxial and other cables, some fixed lead case and some flexible, something like the branches of a tree coming from the main trunk. At each branch one cable would split into two at a junction box. Thus there were several junction boxes. At each junction box whereas the electrical insulation between the inner and outer cores of the coaxial cable had to show infinite resistance when measured, the electrical connection between the three outer cores and the junction box had to be zero resistance. To prevent water ingress at the junction box, the space inside the junction box all around the outer core connections was packed with lead wool. Lead wool is like kitchen use steel wool except that it is made of spun lead. No matter how hard the lead wool was packed, complete water tight integrity was not always achieved. The greater the number of junction boxes, the greater the potential for water ingress to cause short circuits and no signal at worst, or low resistance and therefore loss of signal strength at best. (Pages 1,2,3, 6 & 12 refer)

Finding a suitable solution to this problem took many months of research in the UK and Australia. One attempt was the inversion of the junction boxes on the mounting, (Pages 4, 6 & 8 refer). This was not succesful. Finally junction boxes were developed to maintain the electrical integrity while remaining totally free of water ingress.

Note 1. Some Type 285 radars had 3 Yagi arrays.

Observations and comments as they relate to the red numbered pages

1. The Officer responsible for Radar was later Lt. Gordon McKinstry Power. Enlisted 29/4/1943. Demobbed 8/12/1947. Served in HMAShips Rushcutter, Platypus, Arunta, Moreton, Watson & Penguin.

After demob, he was appaointed OIC R.A.N. Radio Test Facility Leuchhardt.

The Radar Mechanic was Harry Benjamin Tribe O/N 2308, then 26238. Enlisted 11/2/1042. Demobbed as PO RM 13/2/1946. Served in HMA Ships Cerberus, Lonsdale, Rushcutter, Arunta, Penguin, Moreton, Watson.

The suffix “M” to the number 285 means it had the first modification fitted. “P” & “Q” meant second and third modifications respectively.

SG or “Sugar George” was an American radar. A286P is not related to A285.

At the foot of this page, the only A285 related information is under the “Not Supplied” sub heading and reads “For 285M3 Matched ……. valves type NR88”. Not sure but I think the NR88s were the modulators. The matched pair valve type 99 were the power output transmitters.

2. Nil comment

3. Nil comment

4. Nil comment

5. This refers to Type 286, not 285

6. Para 3 (d) seems to me to be a lame excuse, but perhaps I am over critical.

7. & 8. Two different signatories but identical text. Inversion of the junction boxes was a temporary expedient to overcome the water ingress problem until more effective water proofing was developed.

9. This refers to Type 286, not 285.

10. This refers to Type 286, not 285

11. Nil comment

12. Para II refers to the report on page 4.

13. Pages 1 & 2 report some problems with the P16 receiver. These are unrelated to the main problem of water ingress to the above deck

cables. However, when these are considered as additional problems, the whole 285 serviceability became regarded as unsatisfactory.

14. Can’t make head nor tail of this.

Not evident in any of this correspondence, another typical problem of Type 285 was the mounting orientation of the Yagi dipole assemblies. At manufacture, the pattern number of the unit was engraved into the insulating block, and although it looks the same when installed, the unit must be mounted with the engraving facing down, not up. Incorrect mounting orientation still allowed transmission and reception, but at reduced efficeincy. This had nothing to do with the engraving of course, but with subtle difference in the dipole orientation. If *Arunta* had experienced this problem also, it would have added to the total picture of a poorly performing radar.